

PIPING

Process Valves

BH102-E1

26202774

Scope:

Twenty-three (23) valves were replaced and/or repaired per this EWO.
GV-1 to GV-23

MR # 212899

MR # 203875

Additional Comments/Future Recommendations:

None.

EXTRA Process Valves (24-34)

BH102-E2

26202774

Scope:

Eleven (11) extra valves were replaced and/or repaired per this EWO.
GV-24 to GV-34

MR # 229330

MR # 231455

Additional Comments/Future Recommendations:

None.

EXTRA TAW 6416 Process Valves (36 and 39)

BH102-E3R1

26202774

Scope:

Four (4) valves were replaced and/or repaired per this EWO.
GV-36 to GV-39

MR # 236068

Additional Comments/Future Recommendations:

None.

EXTRA TAW 6563 Process Valves (40)
BH102-E4
26202774

Scope:

One (1) valve was replaced per this EWO.
GV-40

Additional Comments/Future Recommendations:

None.

EXTRA TAW 6714 Process Valves (41-49)
BH102-E5R1
26202774

Scope:

Nine (9) valves were replaced and/or repaired per this EWO.
GV-41 to GV-49

MR # 236069

Additional Comments/Future Recommendations:

None.

EXTRA TAW 6780 Process Valve
BH102-E6R1
26202774

Scope:

One (1) valve was replaced per this EWO.
GV-50

MR # 236072

Additional Comments/Future Recommendations:

None.

**EXTRA TAW 7085 Process Valves (GV 51 & 52)
BH102-E7R1
26202774**

Scope:

Two (2) valves were replaced per this EWO.
GV-51 to GV-52

MR # 237587

Additional Comments/Future Recommendations:

None.

**Temporary Piping–Hot Work Package Acid Wash E410A-F Hot Work Package
BH108-E1
26206304**

Scope:

Temporary shutdown piping was fabricated as required by Operations for shutdown and clean up. This piping was for temporary, general use and removed after the shutdown was completed.

Additional Comments/Future Recommendations:

None.

**EXTRA TAW 6512 F410 HOT PIPING REPLACEMENT
BH109-E1
26206305**

Scope:

The piping to and from F-410 was discovered to be below tmin and would not last to the next scheduled shutdown. The piping on inspection isometric drawings 0951-001-007 and 0951-001-008 was replaced in-kind.

Additional Comments/Future Recommendations:

This piping in this system corroded at a higher rate during the last shutdown interval than previous intervals. Because of the high temperature of this system, on-the-run inspection was not available and the discovery of thin pipe was not found until the plant was shutdown.

The piping was field fabricated and post-weld heat treated by P2S. The dummy leg supports were reused. New thermowells were installed.

**EXTRA 1 1/4" Cr 1/2" Mo Flange Weld Build
BH109-E1-RV 1**

26206305

Scope:

Due to material availability issues, the existing weld neck ring joint 12" and 16" flanges were reused. Due to internal corrosion, the flange ID's had to be weld built before welding to the new XS pipe. Flanges were rebuilt to their original dimensions.

Additional Comments/Future Recommendations:

These flanges were sent to Benicia Fabrication and Machine for weld building and post-weld heat treatment.

EXTRA Revised Post Weld Flange Weld Build (BFM)
BH109-E1-RV 2
26206305

Scope:

This EWO captured the revision to the post-weld heat treatment of the flanges. The duration was increased from 1 hour to 2 hours.

Additional Comments/Future Recommendations:

None.

EXTRA Revised Hot piping PWHT Revised Procedure
BH109-E1-RV 3
26206305

Scope:

This EWO captured the revision to the post-weld heat treatment of the pipe fabrication to and from F-410. The duration was increased from 1 hour to 2 hours.

Additional Comments/Future Recommendations:

None.

**EXTRA Rev 4: Add WPS159 for CS to CR
BH109-E1-RV 4
26206305**

Scope:

This EWO captured the bi-metallic weld procedure for 1-1/4 Cr to CS weld.

Additional Comments/Future Recommendations:

None.

**V-442 Replace Sour Water Line
BH115-E1
26206306r**

Scope:

Approximately 30 linear feet of 2" sour water piping near V-442 was replaced in-kind (AF4) due to internal corrosion.

Additional Comments/Future Recommendations:

None.

**EXTRA TAW 6398 Eight (8) Union Blinds @ Plot Limit to Flanges & Spectacle
Blinds
BH116-E1-Rv
126206307**

Scope:

Additional Comments/Future Recommendations:

None.

**Replace 1.5" Gate Vlv & Piping On Line Off of Relief Header @ Plot Limit
(REFER TO BOUNDARY BLIND LIST BH101-02 PLM GROUND)**

**BH116-E1
26206307r**

**EXTRA TAW 6398 Eight (8) Union Blinds @ Plot Limit to Flanges & Spectacle
Blinds**

**BH116-E1-Rv1
26206307**

EXTRA Add Valves and Flanges to Union Blinds @ Plot Limit

**BH116-E1-Rv2
26206307**

**EXTRA Supplement to Rv 2 Add Valves and Flanges to Union Blinds @ Plot
Limit**

**BH116-E1-Rv2-Sup 1
26206307**

EXTRA Supplement to Rv 3 Added Piping from ISO 0954-004-001

**BH116-E1-Rv3-Sup 2
26206307**

EXTRA Supplement to Rv 4 SK-1385-10 & 11 Replace two (2) Unions

**BH116-E1-Rv4
26206307**

Scope:

Rev. 0: Approximately 3 linear feet of 1-1/2" relief piping was replaced in-kind (AB0/AF4) due to external corrosion.

Rev. 1: During the shutdown, eight (8) union blinds were unable to be operated and were also replaced.

Rev. 2: Added flanges and valves to the new piping spools.

Rev. 3: Added piping from inspection isometric 0954-004-001.

Rev. 4: Added drawings SK-1385-10 & 11 to replace two (2) additional unions.

MR # 237175

Additional Comments/Future Recommendations:

None.

1Q-2007 D&R SHUTDOWN – NHT

105 & 168 Line - Demo Abandon Pipe Lines /Replace Drain In-Kind & DEMO RELIEF LINE

BH117-E1

26206308

105 & 168 Line - Demo Abandon Pipe Lines OTR

BH117-E1-RV 1

26206308

105 & 168 Line - Increase dummy leg size to 6" on 105 line

BH117-E1-RV2

26206308

Scope:

Approximately 200 linear of H2S abandoned piping between the NHT and caustic scrubber was demolished during the shutdown. The line was internally corroded per Inspection Recommendation # 0951-003-006 and 0951-003-007. Also, a 3/4" drain on Line 168 was replaced in-kind per Inspection Recommendation # 0950-009-017.

Additional Comments/Future Recommendations:

The relief line demo described in this EWO (SKT-960-001 & SKT-D-312389) was NOT performed during the shutdown. **This work shall be completed during the next shutdown.**

5NHT – V912 – Replace Piping for CUI

BH118-E1

26206232

Scope:

1-1/2" relief piping from V-912 instruments was replaced due to corrosion under insulation (CUI).

Additional Comments/Future Recommendations:

None.

**C440 Replace 3 Sections OH Line
BH122-E1
26200983**

Scope:

Three (3) sections of 2" and 3" piping on the C-440 overhead line were identified as needing replaced per inspection recommendation # 0951-005-005. These sections were replaced in-kind during the shutdown.

MR # 201877

Additional Comments/Future Recommendations:

None.

**V-430 Replace Steam Out Piping (NO BLINDS REQUIRED)
BH123-E1R1
26206309**

Scope:

Approximately 35 linear feet of 1-1/2" V-430 steam-out piping (AF2) was replaced due to corrosion under insulation (CUI). The piping was replaced in-kind.

Additional Comments/Future Recommendations:

None.

**EXTRA - V430 Inst Piping Replacement & replace Valve GV-22 (NO BLINDS REQUIRED)
BH124-E1
26206249**

**EXTRA - V430 Rv 1" Flange valve to V-430 gauge connection
BH124-E1-RV 1
26206249**

Scope:

Approximately 4 linear feet of 1" V-430 instrument piping (AF2) was replaced due to corrosion under insulation (CUI). The piping was replaced in-kind, except a set of flanges was added at the 1" nozzle connection to V-430.

Additional Comments/Future Recommendations:

None.

**EXTRA R-410 Replace 16" Inlet/Outlet Elbow Spool. Upgraded 1 1/4" Cr 1/2/Mo Material Recos: 56416/56436 (SEE R410 EQUIP BLIND LIST)
BH127-E1
26218748**

Scope:

The flanged elbows connected to the inlet and outlet of the R-410 reactor were replaced during the shutdown. These elbows were upgraded from C-1/2 Mo to 1-1/4" Cr 1/2 Mo.

Additional Comments/Future Recommendations:

None.

**EXTRA N2 TO Make Up H2 Line CUI Damage (Reco 57616)
BH128-E1
26218749**

Scope:

A section of 2" N2 piping was replaced in-kind on line no. 4N4-2"-E1. The line had severe corrosion under insulation (CUI).

Additional Comments/Future Recommendations:

None.

**EXTRA C440 Overhead Line Replace CUI Piping (Reco 58057)
BH129-E1
26218750**

Scope:

16" CS C-440 overhead piping (AF2) identified in inspection recommendation # 58057 was replaced in-kind due to corrosion under insulation (CUI).

Additional Comments/Future Recommendations:

None.

**EXTRA V476 NITRO LINE CUI PIPING (Reco 58116) (SEE BH302-O1)
BH130-E1
26218751**

Scope:

3/4" CS V-476 nitrogen piping (AB0) identified in inspection recommendation # 58116 was replaced in-kind due to corrosion under insulation (CUI).

Additional Comments/Future Recommendations:

None.

**EXTRA RECO 58276 C-1190 TO P-411/A BOTTOM PIPING
BH131-E1
26222012**

Scope:

A section of C-1190 bottoms piping (AB0) was replaced in-kind due to corrosion under insulation (CUI).

Additional Comments/Future Recommendations:

None.

**EXTRA RECO 58876 C-440 BOTTOMS (C-440 PUMP AROUND LINE) (SEE
BH302-O1 FOR BLIND LIST)
BH132-E1
26220687**

Scope:

Per inspection recommendation # 58876, a section of C-440 pump-around piping (AF1) was replaced in-kind due to corrosion under insulation (CUI).

Additional Comments/Future Recommendations:

None.

**EXTRA TAW6344 150# STM. @ the STRAHMAN MIXER: Replace Line
BH133-E1
26222980**

Scope:

A 150# steam line Strahman mixer at pipe stanchion 6 on the east side of the north/south pipe rack had multiple leaks at valves and fittings due to corrosion under insulation (CUI). The piping was replaced in-kind during the shutdown.

Additional Comments/Future Recommendations:

None.

**EXTRA TAW 6369 LV433 Replace Control Vlv. Minor pipe spool replacement.
BH134-E1
26220696**

Scope:

The angled control valve FC-433 was replaced with a Dresser #88-18433F vertical control valve during the shutdown. This replacement required a minor pipe spool replacement (18" long, 2" and 1-1/2" diameter CS flanged pipe).

Additional Comments/Future Recommendations:

The valve in place prior to the shutdown was an angle valve and could only be installed backwards. When installed backwards, the valve was a reliability problem because it's a high pressure drop valve (500 psig upstream, 50 psig downstream). As a result, the pressure forces the plug closed under low flow conditions and created excessive trim/wear damage.

**EXTRA TAW 6393 NHT FRESH WATER LINE - Remove 3 clamps.
BH135-E1
26220697**

Scope:

A 2" fresh water line in the NHT had three (3) clamps on it, which were not in the MOC database (potentially installed pre-1995?). These clamps could not have been removed OTR because the line is needed to hold vacuum on the K-550 compressor "popper valve". This section of piping was replaced in-kind during the shutdown.

Additional Comments/Future Recommendations:

None.

EXTRA TAW 6426 Replace corroded flanges on P-411 & P-411A discharge piping

**BH136-E1
26220700**

Scope:

Following removal of the P-411 & P-411A discharge valves (scheduled to be replaced), the upstream and downstream pipe flanges were inspected. All four (4) flanges were found to have serious corrosion and needed replacement. These 8" flanges (AF1) were replaced during the shutdown.

MR # 234443

Additional Comments/Future Recommendations:

None.

**EXTRA TAW 6484 V-420 INLET SPOOL
BH137-E1
26200954**

Scope:

A 3/4" bleeder valve was scheduled for replacement on the V-420 6" inlet spool. On the same spool, another 3/4" valve connecting the inlet to a sample station. This valve was broken and could not be opened. It could not be repaired by Bay Valve. The spool and valves were replaced in-kind.

Additional Comments/Future Recommendations:

None.

**EXTRA TAW 6699 E-495 BFW BYPASS PIPING
BH140-E1
26220703**

**EXTRA TAW 6699 E-495 SUPPORTS FOR BFW BYPASS PIPING
BH140-E1-RV 1
26220703**

Scope:

During the shutdown, inspection found corrosion in the E-495 boiler feed water exchanger. Process engineering determined the exchanger was not necessary for operation. Therefore, a piping spool was fabricated and installed to bypass the exchanger.

Additional Comments/Future Recommendations:

Process engineering should re-evaluate prior to the next shutdown to determine if new tubes should be purchased for E-495 and have it placed in service.

FURNACES

**F-447 TAW 6509 four steam snuffing nozzles are corroded to failure
BH202-E1
26206311**

Scope:

The four (4) snuffing steam nozzles were corroded due to carburization. They were replaced during the shutdown.



Additional Comments/Future Recommendations:

None.

**F-447 TAW 6515 Refractory Repairs/Partial Replacement of East Corbel
BH202-E2
26206311**

Scope:

The corbel support for the ledge directly below the first radiant tube had failed due to distortion of the steel wall skin and structural steel used to support the corbel. The 4" x 4" x 1/2" steel angle was stitch welded in a continuous piece along the entire length of the wall. When this piece grew due to thermal expansion, it bowed outward toward the center of the furnace and pushed the refractory away from the wall. The repair of the structural steel replaced this angle with 4' sections spaced 1" apart. The 2" x 2" x 1/4" angle originally used as a refractory anchor was removed. The existing 3" x 2" x 1/4" steel angle was left in place. Afterwards, JT Thorpe installed anchors and casted the ledge in place.

MR # 235047





**F-447 TAW 6547 Tube/Hanger Impingement
BH202-E3
26206311**

Scope:

Engineering found grooves in two furnace tubes in F-447. These grooves were a result of misalignment of the top loop on the east wall of the furnace with the tubes lying on the hanger inboard restraint nubbin for an unknown period of time. The thermal expansion of the tubes caused the nubbins to rub a groove into the tubes. Two grooves were weld-repaired and ground flush.





Additional Comments/Future Recommendations:

None.

COLUMNS/VESSELS

C-440

Inspection and Results

Scope:

It took almost 2 weeks to clean C-440 for mechanical inspection. However, mechanically, the column looked extremely good. Miscellaneous hardware was replaced by the contractor (Canatex) and one bubble cap was missing (it was replaced with one of the numerous spares).

MR # 00226400

Additional Comments/Future Recommendations:

As contingency, due to the high corrosion rates seen in the NHT plant, approximately 1000 bubble caps were purchased for C-440 and C-450 prior to the shutdown. However, only one (1) bubble cap was used in both columns. **Do not purchase bubble caps for the next shutdown. These spares shall be stored in the warehouse and saved as contingency for the next shutdown.**

C-450

Inspection and Results

Scope:

Mechanically, C-450 looked extremely good. Miscellaneous hardware was replaced by the contractor (Canatex).

MR # 00226400

Additional Comments/Future Recommendations:

As contingency, due to the high corrosion rates seen in the NHT plant, approximately 1000 bubble caps were purchased for C-440 and C-450 prior to the shutdown. However, only one (1) bubble cap was used in both columns.

Do not purchase bubble caps for the next shutdown. These spares shall be stored in the warehouse and saved as contingency for the next shutdown.

**EXTRA TAW 6434 R-410 TI SUPPORT & GUSSET WELD REPAIRS
BH301-E2
26203034**

Scope:

The rolled plate support for the thermowell at Nozzle N4d was permanently distorted downward due to the load imposed on the thermowell during service and settling of catalyst beneath the thermowell. The thermowell support is located in the northeast quadrant of the vessel about four feet below the tangent line. The rolled plate was cut off approximately 1/2" from the tow of the fillet attachment, turned 180 degrees, and re-attached in a horizontal position.

Two vertical gusset welds on the beams supporting the catalyst bed were repaired and weld overlaid.

Also, the three (3) thermowells and TI's were replaced. One was bent and the other two were removed to inspect the nozzle internals. They were damaged during removal and replacements were ordered from O'Brien Ironworks.





Additional Comments/Future Recommendations:

Prior to internal inspection, the reactor was grit blasted by Redwood. The “unused” thermowell nozzle and PI nozzle were cleaned and inspected. At first, it appeared there was internal corrosion of the full penetration weld on the “paste-on” nozzles (similar to the weld pitting seen on the support gussets elsewhere in the reactor). After further inspection and analysis by a corrosion specialist (Dave Cooke), pressure vessel specialist (Dave Bosi), inspection (Joe George), and engineering (Ken Mertes), it was determined that the weld was not corroding. Instead, it appears there was a lip due to the difference in the nozzle and shell diameters. It also appears that the root weld may not have been the best quality. **However, during the next internal inspection of this reactor, the TI and PI nozzles shall be inspected to determine if any additional corrosion has occurred. Numerous photographs were taken of these nozzles.**





During removal of the thermowells, the nozzle flange gasket surfaces were severely damaged with a hammer. These flanges were lap repaired by a machinist.



**EXTRA V-430 Shell Weld Overlay
BH305-E2
26200952**

**EXTRA V-430 Shell Weld Overlay ~ Lowered Preheat. See EWO
BH305-E2-Rv 1
26200952**

**EXTRA V-430 Shell Weld Overlay 1 1/2" Steam Nozzle
BH305-E3
26200952**

Scope:

Prior to the shutdown, UT inspection detected a lowest remaining wall thickness (RWT) of 2.120" in the bottom portion of the shell, near the demister pad, of V-430. This value was approaching the Tmin value of 2.018". To prevent further corrosion of the shell in this area, the shell was weld overlaid with 3/16" thick CS weld material.

During the shutdown, it was discovered that the 1-1/2" steam nozzle had pitted corrosion. This area was weld overlaid as well.





Additional Comments/Future Recommendations:

During the shutdown, it was found that a lesser amount of area needed to be weld overlaid behind the demister. However, the area beneath the demister pad required weld overlay.

V-440
Pitting Discovered in Bottom of V-440

Scope:

During the shutdown, V-440 was opened for inspection. No work was originally planned for this vessel. During inspection, some localized pitting was found. A meeting was held to determine a plan of action.

First, it was found that the SIS had an incorrect T_{min} value. The SIS T_{min} was calculated by simply subtracting the corrosion allowance from the original thickness. The actual T_{mins} were calculated (Shell = 0.685", Head = 0.680") and the SIS was updated.

The lowest thickness found while pit-gauging was 0.800". The NHT has seen outrageously high corrosion rates over the past 5 years, but process controls (pH monitoring, water injections, etc.) have been installed to reduce these rates. Even when using the high rates, it will take 6 years to reach T_{min}. Based on the long term corrosion rates, the vessel has 25 years of life remaining.

Based on this data, it was concluded to prepare the internal surface of the vessel to obtain good UT readings on the run. The vessel can be safely operated without restrictions until the next shutdown.



Meeting Notes for V-440 from 1/29/07

The attached reference materials were provided for discussion of the approximately 30" wide by 14' long corroded bottom section of the V-440. From the meeting, the following path forward was decided:

V-440 has 6 years of remaining life available based on the latest thickness readings and the 20-mpy short term corrosion rate. Per code, this requires a compliance inspection at the half life of the vessel or data proving the vessel corrosion rate is as advertised or less. The following plan was developed during the meeting:

- No weld repair would be required to make the next TAR at the current corrosion rates. If corrosion rates were to accelerate slightly, we would still have the option to do a fitness for service analysis for the vessel to make the next TAR. Also, if corrosion rates do accelerate excessively, it is likely that other problems upstream of this vessel would require an unplanned SD prior to this vessel.
- Develop an external inspection map, prep the interior surfaces of the vessel at the inspection points, and take baseline thickness measurements of the vessel during this TAR.
- Return the vessel to service and periodically perform on-line thickness measurements. These measurements will be evaluated against the TAR baseline points to prove the corrosion rate is at or below 20-mpy. This on-line monitoring will allow the vessel to make the next TAR cycle before reaching the calculated T-min.
- Use the online evaluation data to evaluate a repair or replacement plan for the vessel during the next TAR if needed.

Corrosion rates were also briefly discussed in the meeting. Many levels of process controls (PH monitoring, water injections, etc.) have been installed since the excessive corrosion mechanisms were identified in the plant. These process controls were added as an effort of controlling corrosion rates throughout the plant. It is expected that the 20-mpy corrosion rate will decrease in the future as a result of these controls.

Meeting Attendees:

Dave Bosi	Tom Wisherhop	Garth Jolly	Scott Blackwell
Dave Cooke	Joe George	Larry Lew	
Jessica Stankiewicz	Craig Dillon	Ken Mertes	

Additional Comments/Future Recommendations:

Perform OTR inspection. **Inspect V-440 next shutdown to see if corrosion has advanced.**

V-496
Inspection and Results

Scope:

During the shutdown, corrosion under insulation was discovered on V-496. Wall thickness and Tmin values are as follows:

Original Vessel Wall Thickness = 0.3125"
Existing Minimum Wall Thickness = 0.2325" (pitting depth = 0.08")

Tmin = 0.1875" per Original U-1 Data Report
Tmin = 0.047" per Engineering Calculations for Internal Pressure
Tmin = 0.160" per Engineering Calculation for External Pressure

The vessel was coated per specification 12.7 and re-insulated for personal protection.

Additional Comments/Future Recommendations:

None.

EXTRA TAW 7219: Repair BFW DWGS. 0951-010-002 & 003
BH313-E1
26206316

EXTRA TAW 7219: Replace 4 2" BFW Branch Connections
BH313-E1-RV1
26206316

Scope:

Corrosion under insulation (CUI) was discovered on four (4) 2" branch connections on the boiler feed water system during the shutdown. Minimum thickness readings on the four branches were measured at 0.09" and 0.15". These branches were replaced up to the 4" header during the shutdown.

MR # 238744

Additional Comments/Future Recommendations:

None.

EXCHANGERS

All Heat Exchanger Data was reviewed and update for all the exchanger during this Shutdown. Any gasket changes and torque procedure revisions were documented in the 2 binders labeled D&R 1Q 2007 S/D Heat Exchanger Gasket Info and Updates.

E-410 A/B CHANNEL REPLACEMENT (CAPITAL)

EWO# BH401-E1

W/O# 26206297

Scope:

- Pull bundle and inspect: API-510/HTHA Insp, Hydroblast TS/SS, ET 20% (142) Tubes, Gritblast Shell Internally, Hydrotest, Strip All Insul. from Shell.
- No issues found from inspection.
- New channel were installed as planned. Channels fabricated by BFM.

Additional Comments/Future Recommendations:

- These exchanger requires 12 collar studs each.
 - For bolting make sure to use washer on both sides. The collar bolts have to be washered on both sides the standard studs do not, but you cannot count on the contractor to know that. If you do not have enough washers for both side before you start the S/D you will be ordering them during the shutdown at 2x the cost. Heat Exchanger Data Base updated from B16 washers to B7. No need for the B16 washers it is a waste of money.
 - No changes made to the gasket design from the pervious S/D. It was noted that there was evidence of the Channel bottoming out against the Fixed Tube Sheet (on both A and B units). There were no leak issues prior to the S/D.
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E-410C Bundle Retube @ BFM (EXTRA WORK TAW 6758)

EWO# BH403-E1

W/O #26206318

Scope:

- Pull bundle and inspect: API-510/HTHA Insp, Hydroblast TS/SS, ET 20% (142) Tubes, Gritblast Shell Internally, Hydrotest, Strip All Insul. from Shell.
- Bundle need to be retubed during the S/D. The existing tubes were 12ga. C.S. Bundle was retubed with 12 ga. C.S. The bundle did not come apart easily. The bundle's baffles and had to be fabricated new.
- Retubed by BFM
- 4 tubes were plugged on new bundle due to mechanical damage.

Additional Comments/Future Recommendations:

See historical notes below in E-410F comments for E410 C, D, E, & F.

E-410D Bundle Retube @ BFM (EXTRA WORK TAW 6758)

EWO# BH404-E1

W/O# 26206318

Scope:

- Pull bundle and inspect: API-510/HTHA Insp, Hydroblast TS/SS, ET 20% (142) Tubes, Gritblast Shell Internally, Hydrotest, Strip All Insul. from Shell.
- Bundle need to be retubed during the S/D. The existing tubes were 12ga. C.S. Bundle was retubed with 12 ga. C.S. The bundle did not come apart easily. The bundle's baffles and had to be fabricated new.
- Retubed by BFM

Additional Comments/Future Recommendations:

See historical notes below in E-410F comments for E410 C, D, E, & F.

E-410E Shell Weld Overlay (EXTRA WORK)

BH405-E1

26206318

EXTRA E-410E Shell Weld Overlay ~Lowered Preheat PT

BH405-E1 RV 1

Scope:

- Prior to the shutdown, UT inspection detected a lowest remaining wall thickness (RWT) of 0.890" in the bottom portion of the shell, at the end opposite the channel, of E-410E. This value was approaching the calculated Tmin value of 0.855". To prevent further corrosion of the shell in this area, the shell was weld overlaid with 3/16" thick CS weld material.

Additional Comments/Future Recommendations:

During the shutdown, a go/no-go gauge was fabricated and used to determine out-of-roundness tolerances by a machinist after weld repair.

See historical notes below in E-410F comments for E410 C, D, E, & F.

E-410E & F RETUBE (EXTRA WORK TAW 6729)

EWO# BH405-E2

W/O# 26206318

Scope:

- E & F Bundles needed to be retubed during the S/D. The existing tubes were 12ga. C.S. Bundle was retubed with 12 ga. C.S.
- Retubed at BFM

Additional Comments/Future Recommendations:

Historical notes for E-410 C, D, E & F Bundles

- These unit originally came with Bundles with 14 Ga. (0.085 min) SA-214 C.S
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- 1987: bundles E & F upgraded to 12 Ga.
- 1994 3/8/94 BM# 43871 Purchased new C bundle not installed on 2/94 S/D. no tube size specified
- 1993 (12/17/93) MB# 43835 Rev 1, two bundles purchased 12 GA .110min SA-214 C.S. to replace C& D bundles. BM states E & F are already upgraded to 12 Ga.
- Note tube sheet with Job # 366516 B I believe to be a new bundle purchased Job # 366516 A/B Ohmstede drawing in 2/94 S/D book.
- 1985 A&B were made 16ga 0.065" T-304 SS
- BFM retube bundles at some point after 1994 not sure which ones.
- 1Q/07 S/D we retubed C,D,E, and F with 12ga C.S. tubes.

E-410F Shell Weld Overlay (EXTRA WORK)

EW0# BH406-E1

W/O# 26206318

E-410F Shell Weld Overlay~Lowered Preheat PT (EXTRA WORK)

BH406-E1-Rv 1

26206318

Scope:

Prior to the shutdown, UT inspection detected a lowest remaining wall thickness (RWT) of 0.890" in the bottom portion of the shell, at the end opposite the channel, of E-410F. This value was approaching the calculated Tmin value of 0.855". To prevent further corrosion of the shell in this area, the shell was weld overlaid with 3/16" thick CS weld material.

Additional Comments/Future Recommendations:

During the shutdown, a go/no-go gauge was fabricated and used to determine out-of-roundness tolerances by a machinist.

E-432 New Bundle - CAPITAL (EXTRA WORK)

BH414-E1

26206348

Scope:

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Additional Comments/Future Recommendations:

None.

E-432 TAW- 6432 Repair Channel and Channel Cover (EXTRA WORK)

BH414-E2

026206348

Scope:

When the exchanger was opened, baffle was bowed and corroded. Leading edge that fin into the baffle groove in the channel was severely corroded. Channel cover had aggressive corrosion in the baffle groove where the baffle did not seal properly. The baffle was replaced and the dollar plate was weld-built and machined during the shutdown.

Additional Comments/Future Recommendations:

This work was performed by BFM.

**E435 Repair Channel and Channel Cover (TAW- 6433)
BH415-E1
26206319**

Scope:

When the exchanger was opened, baffle was bowed and corroded. Leading edge that fin into the baffle groove in the channel was severely corroded. Channel cover had aggressive corrosion in the baffle groove where the baffle did not seal properly. The damage and corrosion was similar to E-432. The baffle was replaced and the dollar plate was weld-built and machined during the shutdown.

Additional Comments/Future Recommendations:

This work was performed by BFM.

**E-435 REPLACE BUNDLE IN KIND (CAPITAL)
26206261**

Scope:

XXXX

Additional Comments/Future Recommendations:

None.

**E-440 Install ferrules into E-440A1-A2-B1-B2 (EXTRA TAW 6655)
BH416-E1
26206320**

Scope:

During the shutdown, inspection found corrosion on the inlet-side of the tube/tubesheet connection on the E-440 fin fans. It was originally decided to use carbon steel ferrules to prevent further corrosion for another 5-year run.

Additional Comments/Future Recommendations:

1Q-2007 D&R SHUTDOWN – NHT

After further analysis, it was determined ferrules were not a suitable repair. Instead, these fin fan bundles were replaced in-kind during the shutdown (see BH416-E2).

E440 A-D CAPITAL NEW FIN FANS (EXTRA WORK) BH416-E2 26224048

Scope:

During the shutdown, inspection found corrosion on the inlet-side of the tube/tubesheet connection on the E-440 fin fans. These fin fan bundles were replaced in-kind during the shutdown.

Additional Comments/Future Recommendations:

None.

E-445A API 510, REPLACE BUNDLE IN KIND (CAPITAL) BH421-E1 26206324

Scope:

XXXX

Additional Comments/Future Recommendations:

None.

E-455 Replace Sixteen (16) Magnesium Anodes BH426-E1 26200275

Scope:

Sixteen magnesium anodes were replaced on the partition plates inside the channel/cooling water-side of E-455.

Additional Comments/Future Recommendations:

None.

EXTRA TAW 6312 E-457 Side Cut Stripper Reboiler Perform shell side BH428-I1 26220692 service test. Tube Leak?

Scope:

XXXX

Additional Comments/Future Recommendations:

None.
